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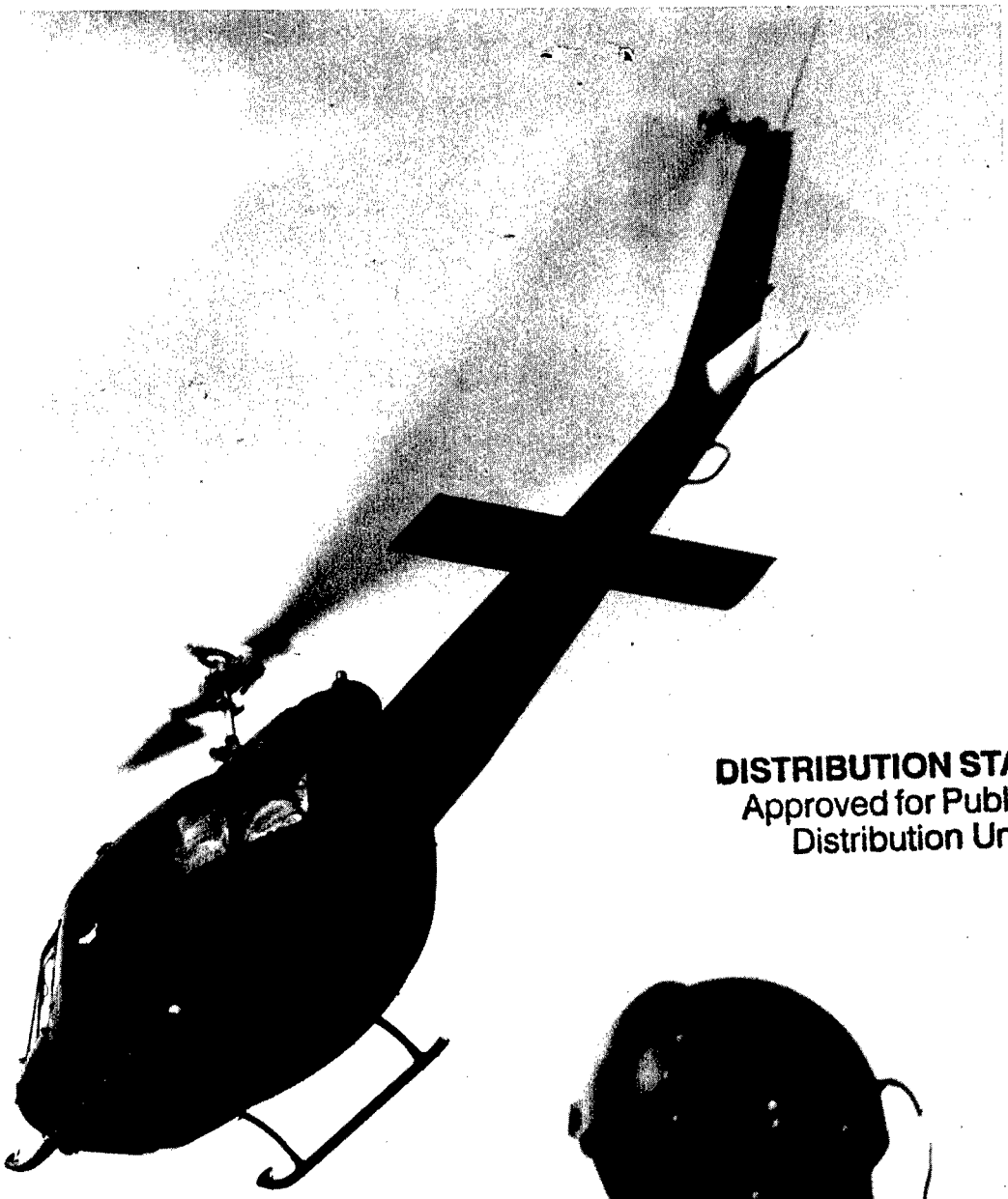

AVIATORS WITH TWO OR MORE PILOT-ERROR ACCIDENTS

PREPARED BY THE U.S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH USABAAR

Technical Report 72-2

AVIATORS WITH TWO OR MORE PILOT-ERROR ACCIDENTS

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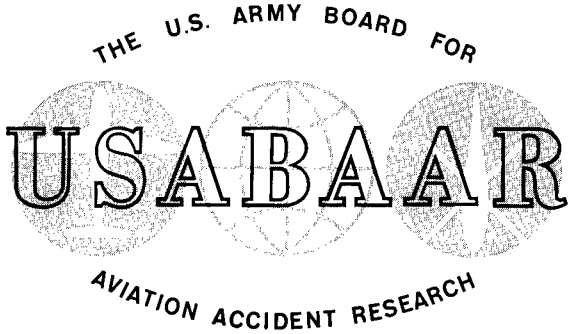

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Aviators With Two or More Pilot-Error Accidents

I. ABSTRACT. In an attempt to develop indicators which would permit identification of those Army aviators most likely to suffer pilot-error accidents, USABAAR's data base was interrogated for aviators who had had two or more pilot-error accidents during a 30-month period. One hundred and twenty-three such aviators and 249 accidents were identified.

These accidents were analyzed for causative factors and the aviators for distinguishing characteristics which might assist in identifying those with a high potential for pilot-error accidents.

No characteristics permitting this identification could be documented. However, several empirical points for commanders and supervisors to use in the prevention of pilot error accidents were developed.

II. SUMMARY AND CONCLUSIONS. A three-part study conducted on those aviators involved in more than one pilot-error accident has shown that:

Accident reports using the old DA Form 2397 series, and especially the USARV Form 232 series, seldom contain sufficient pilot background information on which to base a prediction of that pilot's future accident potential. The new DA Form 2397 series will be far more likely to contain the kind of data needed for such studies.

Aviators with two or more personal error accidents during the time period studied are not distinguishable from their fellow aviators, on the basis of currently available information.

Gross negligence (e.g., fuel exhaustion) and violation of air discipline or established orders (e.g., buzzing) were found infrequently.

Command action has not been vigorous in many cases. Instructor pilot or aircraft commander orders were revoked in only six instances after the second accident in which the same individual was at fault, once after the third, and in two instances after the first accident. Four FEB actions were noted in the reports after the second accident, and in one case the pilot was sent before a Physical Evaluation Board. Additional training was noted in only two cases after the second accident as was "counseling" in two others. One pilot was restricted to copilot duties after the first accident and to pilot duties only with an experienced aircraft commander after the second accident.

Supervisory error occurred in one out of every five of these accidents.

While these findings are of themselves insufficient to afford valid criteria by which aviators may be assessed to determine their potential for a pilot-error accident, the results of this study have been used to develop a series of points for aviation commanders to use as a guide to reduce this type of accident within their units. A summary of these points is contained in appendix B.

III. INTRODUCTION. The U.S. Army Board for Aviation Accident Research has long been interested in the use of data from aircraft accident reports to develop a number of indications that, taken together, might serve as a practical guide for the use of commanders and supervisors in the prevention of aircraft accidents. Since more than half of all Army aircraft accidents are the direct result of pilot errors, it was decided to seek these predictive factors in those accidents definitely attributable to this cause.

IV. MATERIALS AND METHODS. A 2½-year sampling (1 January 1967 – 30 June 1969) of the USABAAR data bank for aviators responsible for more than one pilot-error accident printed out 135 names which would be reduced later to 123 because of duplications. Since these pilots constituted a small percentage of the active aviator population, it was postulated that these men were in some way different from their fellow pilots who did not have two or more personal error accidents during the same period. But preliminary analysis of the data did not give any clues as to what made them different.

Therefore, the study was continued to compare aviators who had two or more pilot-error accidents in a UH-1 aircraft during the 2½-year period with approximately 1,000 other aviators who had a UH-1 accident during this period not attributed to pilot error. The two groups were compared with respect to age, rank, branch, years of

flying experience, and ratings and qualifications. These factors were selected for comparison because they were available from accident reports on file at USABAAR.

As part of the search for some measure of distinguishing these pilots, the 273 original accident reports were pulled from USABAAR files and each individual report was reread and analyzed. The analysts were instructed to look for anything in the accident report that would have indicated to an alert commander that the individual responsible had an increased potential for an accident.

Twenty-four of the original 273 accidents, involving 12 pilots, had to be eliminated from the study for various reasons—the most significant reason being that the data bank produced certain names and reports in which the surname, first name, and middle initial were identical, but actually involved different aviators. Also, some case reports were recorded under two different case numbers. Therefore, the individual's name showed up twice in the data bank, when in fact the individual had had only one accident. As a result, only 123 aviators and 249 accidents were actually studied.

The study was greatly restricted by the fact that 187, or approximately 70 percent, of the accidents occured in the Republic of Vietnam and required only a cursory USARV Form 232 investigation report. The information contained in this form proved inadequate for making anything other than the most rudimentary determination of cause and surrounding circumstances.

V. RESULTS. *Preliminary analysis:* The USABAAR data bank was sampled for the period 1 January 1967-30 June 1969 in a search for aviators having more than one pilot-error accident. One hundred and twenty-three such aviators were identified. Three of these aviators had three accidents each. Thus, the 123 aviators had 249 accidents in the period sampled. The data system permits two errors to be recorded for each aviator, and in 139 of the accidents, two errors were charged to the responsible pilot. Seventeen pilots committed the same error in both accidents.

The USABAAR code manual has 25 separate categories of personnel error accident causes, and each cause category has up to nine subcategories which further define the error. In this study, all but four of the categories were represented. There were no accidents in which the *pilot failed to extend landing gear,* nor any in which *retracting the gear* caused the accident. No accidents were attributed to *improper instrument procedures* and none was attributed to *improper use of special equipment,* including weapons and reconnaissance equipment. Only one accident was attributed to each of two catagories: *exceeded stress limits of the aircraft* and *improper loading technique* as a nonpilot crew factor. Two accidents were listed under each of two other categories: *became lost* and *improper use of miscellaneous equipment.* Seven accidents involved *improper use/mismanagement of fuel supply,* and in nine accidents the pilot *failed to initiate go-around or attempted too late.* Thirteen other categories were listed 11 to 28 times each, and the remaining two categories were by far the most commonly recorded, with 73 and 88 accidents listed. These categories are discussed below:

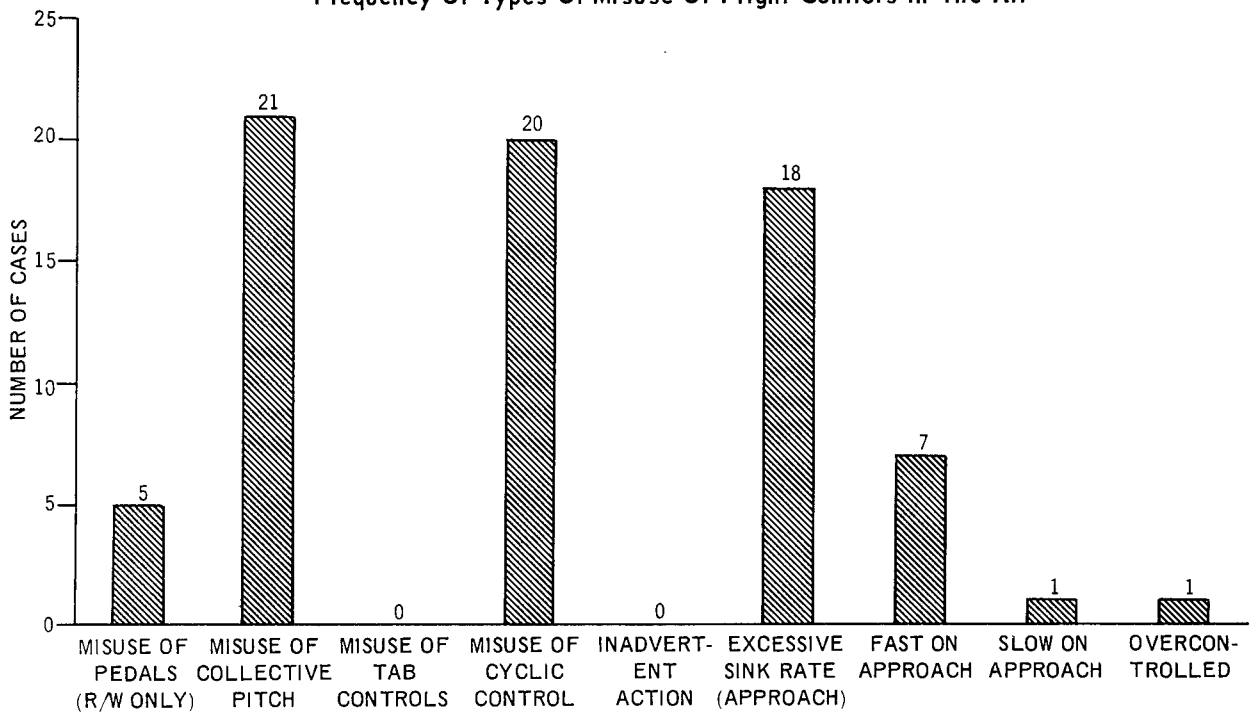
Misuse of flight controls in the air was listed 73 times. This category, tabulated by its subgroups, appears in figure 1.

The *miscellaneous factors* category was the most frequently coded, with 88 entries. These may be subgrouped as follows: failed to initiate precautionary landing after encountering mechanical malfunction and attempted to return to home base or go on to destination—5 instances; misread or misinterpreted flight instruments—4 instances; became preoccupied at a critical moment—12 instances; failed to consider relative wind during ground or water operations—2 instances; used improper emergency technique—15 instances; failed to recognize a dangerous situation and take appropriate corrective action—28 instances; and inadequately evaluated existing circumstances—22 instances. The last two groups are very similar and, in many accidents, it is difficult to decide which code better describes the error made by the pilot.

Failure to see aircraft or objects and avoid collision was coded 28 times. Only one of these was a midair collision with another aircraft.

FIGURE 1

Frequency Of Types Of Misuse Of Flight Controls In The Air



Misjudged distance, altitude or position was the cause in 28 instances.

Failure to maintain flying speed occurred in 22 accidents. Twelve instances were failure to maintain engine or rotor rpm.

Misuse of brakes or flight controls on ground and *failure to supervise flight properly* were the next most common errors, with 21 entries each.

Physical condition of the pilot was coded 13 times. This category includes fatigue, disorientation, and general stress.

Inadequate preflight preparation was involved in 18 of the accidents. Six of these were weight and balance problems and four were flights with known aircraft discrepancies.

Violation of air discipline occurred 12 times. There were four instances of violation of general air discipline, five of continued VFR under unfavorable weather, and one each of operating recklessly and violation of specific orders and regulations.

Misuse of power plant controls appeared 13 times.

Failure to compensate for wind was recorded 16 times.

Improper level off, exceeded ability and experience, and *selected unsuitable terrain* were each found 11 times.

Many of the coded mistakes were errors of omission, but the number may be influenced by the fact that the code system was set up with many categories and subgroups beginning with the words "failure to."

An accident involving the most commonly committed errors would be one in which the pilot misused the cyclic or collective controls in the air, probably during approach, and failed to recognize the dangerous situation and take corrective action.

In 129 of the accidents, the pilot having the error was listed as first pilot. In only two cases was an error attributed to the copilot. Instructor pilots were involved in 39 of the accidents. Aircraft commander copilot was listed 82 times. Nonrated student pilots accounted for 11 of the accidents. Civilian IP was listed six times and

civilian first pilot was listed four times. It seems unusual that aircraft commander copilot was listed 82 times and aircraft commander first pilot was not listed. This anomaly may reflect an oddity of the coding system and philosophy rather than the true situation. The fact that in 249 accidents only two copilots were coded as being in error, and 82 AC copilots probably indicates that, in coding, a copilot is almost always innocent of error unless he happens to be an AC, in which case he is almost always guilty.

In 21 cases, the second accident led to the death of the involved aviator. There were 11 instances of serious injury, and 32 cases of minor injury of the involved pilot.

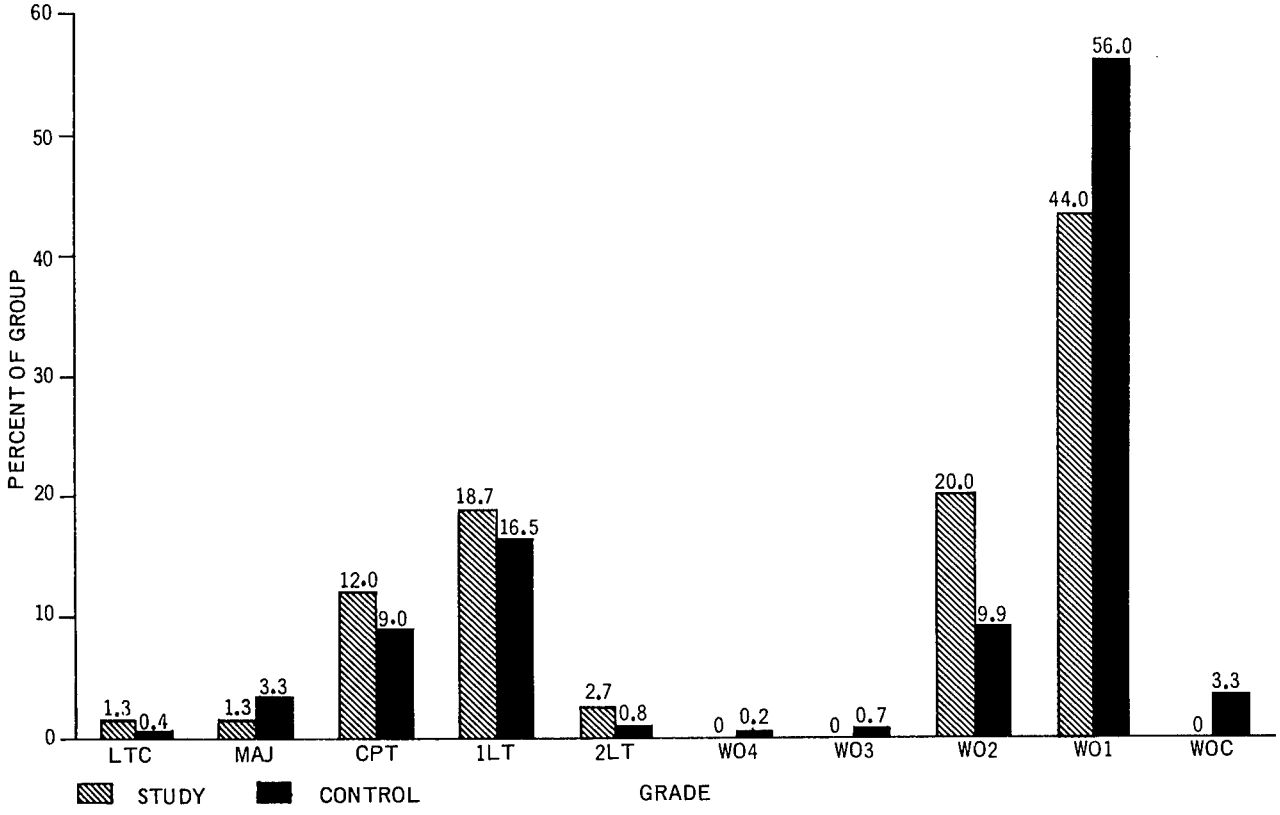
Aviator comparison: The preliminary analysis of the "repeat" pilot error accident showed no characteristic pattern which could be used to formulate a prevention program; therefore, a more detailed analysis was carried out. Examination of USABAAR records indicated that the typical Army aircraft accident occurs in the UH-1 series. In the case of those aviators having two or more pilot-error accidents, 75 had at least one of those accidents in a UH-1.

These 75 aviators were selected for further study. To permit comparison with a number of of presumptively "typical" Army aviators, a control group was selected from among those aviators in USABAAR's files who had been involved in an accident completely attributable to mechanical failure in a UH-1 during the period 1 January 1967–30 June 1971.

These aviators were compared by means of statistical analytical techniques to detect any significant differences between the study and control groups of aviators in age, grade, several types of pilot experience, pilot ratings, and qualifications.

Aviator age at the time of the latest accident ranged between 19 and 49, with a mean value for both groups of 25. The typical grade of both

FIGURE 2
Percent Of Study And Control Groups By Grade



groups was O2 and WO1, probably indicative of the *working* Army aviator, with the number of accidents directly proportional to time flown (figure 2).

Mean values for total pilot experience were found to be 918 hours for the study group and 682 hours for the control group. While large, the extreme variation of hour levels in both groups makes the difference between these figures of no significance. Mean values for total rotary wing pilot experience were found to be 859 hours for the study group and 713 hours for the control group. These values were not significantly different.

The mean for the study group for pilot time during previous 24 hours was 3.7 hours. For the control group the mean was 4.9 hours. The small number (509) of those reported from the control group precludes assignment of any significance to the difference between these figures, particularly if those recording no time during the past 24 hours are subtracted from both groups.

Ratings varied from nonrated student through master Army aviator. The typical aviator in each group was rated as an Army aviator (ARAV), was rotary-wing qualified only, and possessed a tactical instrument qualification. Thus, there was no significant difference between the study and control groups with regard to ratings and qualifications.

In addition, the categories of *total rotary wing time 30 days prior to accident, total time this aircraft,* and *time this aircraft last 30 days* were extracted, but could not be used for comparison because a large number of aviators in each group had more time than that recordable in the category under the data system in use at the time of the accident. (This shortcoming has been corrected in the new USABAAR data system.)

This comparison of available characteristics of the two aviator groups, one composed of those having had two or more accidents due to personnel error, and one composed of aviators having equipment-failure accidents during an 18-month period, showed no significant difference between the groups which might be useful in identifying those aviators more likely than their fellow pilots to have pilot error accidents.

This lack of differentiation may be explained in several ways. First, one may assume that there is, in fact, no measurable difference between the aviator whose potential for an accident caused by his own error is higher than average, and the remainder of the Army aviator population. Second, possible sources of bias in the comparison may be examined. Selection of the control group was limited to those on record at USABAAR, i.e., those who have had accidents. These aviators may well not be representative of the entire Army aviator population. Further, the characteristics available for comparison may not be those which differentiate the aviator with increased potential for pilot-error accidents from the rest of the aviator population. The approach itself is considered valid, however, and should be continued as more personal data on Army aviators become available at USABAAR.

Detailed accident analysis: Because of the equivocal results obtained from preliminary analysis and aviator comparison, the report of each accident identified in the preliminary analysis was read in its entirety. Information concerning personal and psychophysiological factors, prior disciplinary actions, revocation of orders, Flight Evaluation Boards (FEB), etc., where available, was extracted from the report and recorded. In this detailed analysis, it was found that there is insufficient information in the accident reports for the period investigated for accurate prediction of future accidents or trends of individuals or units. Supervisory error was present in some form as a causal factor in 55 of these accidents.

Corrective actions (FEB's, orders revoked, additional training) were taken or were pending as a result of 18 accidents. Aircraft commander or instructor pilot orders were revoked in two cases after the first accident, in six cases after the second accident, and in one case after the third accident. FEB's were convened in four cases after the second accident; additional training was awarded in two cases after the second accident; and counseling was given in two cases after the second accident. One individual was restricted to copilot duties after the first accident and pilot duties with an experienced aircraft

commander after the second accident. The remaining accidents were considered pilot-error accidents with no particular patterns noted. Forty selected accident briefs from this study are presented in appendix A.

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APPENDIX A
SELECTED BRIEFS OF PILOT ERROR ACCIDENTS

Pilot No. 1

UH-1D: Overgross aircraft took off from pinnacle, lost rpm, and crashed into trees. Pilot didn't bother to count troops aboard aircraft.

O-1A: Aircraft being flown with known, questionable mechanical condition, stalled and spun into trees. Pilot was overeager to accomplish mission and personal goals. He was serving as maintenance officer, performed own maintenance, and disregarded safety procedures, policies, regulations and SOP's.

Pilot No. 2

UH-1H: Aviator, serving as IP, demonstrated autorotation and flared abruptly during orientation flight. Tail rotor hit on surface.

UH-1H: Aircraft commander, returning to home base from night medevac, tried to maintain VFR in deteriorating weather and flew into ground. He was offered billeting because of bad weather, but refused.

Pilot No. 3

OH-6A: Main rotor flexed and chopped off tail boom during practice autorotation. IP had a total of 358 flight hours, of which 135 were in OH-6As. Reviewing authority directed that IP's be used sparingly until they have amassed 300 hours pilot time.

OH-6A: In 6 months IP flew 144 hours of IP time and 121 hours of pilot time. This gave him a total of 661 hours. Unit did not comply with reviewing authority's directive (see above). During practice autorotation, main rotor flexed and chopped off tail boom. IP orders were revoked.

Pilot No. 4

OH-13S: Pilot had returned from 1½-hour flight in OH-6A and was told to get airborne again as soon as possible. He and another pilot took two OH-13's which were parked too close in revetments and meshed main rotor blades when starting. Revetments were too close for two aircraft to start at same time.

OH-13S: Engine failed during unnecessary low level flight. Pilot made unsuccessful autorotation and rolled aircraft.

Pilot No. 5

OH-23D: Civilian IP with 105 hours rotary-wing time had two accidents 4 days apart. Both were hard landings resulting from low rpm during practice forced landings. Several maneuvers not required on checkrides were demonstrated only, including low rpm recovery.

Pilot No. 6

UH-1D: Pilot was giving flight instruction to EM. Aircraft started roll to right during pickup and pilot continued to pull collective, with no control response from cyclic to stop roll.

UH-1D: Aircraft lost rpm and crashed during downwind approach. Weather hampered better approach route, but pilot did not make go-around. Pilot flew 135 hours in 21 days.

Pilot No. 7

UH-1D: Aircraft commander allowed pilot to follow lead. Aircraft was too close on landing and pilot flared abruptly and lost tail rotor before AC attempted corrective action.

UH-1D: Pilot had flown 8½ hours, then called at 0200 hours to fly again. He experienced vertigo during takeoff and flew into river.

Pilot No. 8

OH-6A: IP allowed transitioning student to make hard touchdown during autorotation and tail boom was cut off. IP had not completed ground school for type aircraft.

UH-1H: Nose high autorotative landing was made and tail hit landing area.

Pilot No. 9

UH-1D: Aviator was serving as aircraft commander. Aircraft lost rpm on slope and rolled over.

UH-1D: Aircraft commander made steep low altitude flare and experienced tail rotor strike. Aircraft rolled over. Aircraft commander's orders were revoked (two accidents in 20 days).

Pilot No. 10

TH-55A: Instructor pilot used improper pitch application during autorotation and made hard landing. Tail boom was cut off.

OH-13E: Instructor pilot ignored fuel gauge, and exhausted fuel. Improper technique during autorotation resulted in accident.

Pilot No. 11

UH-1D: Aircraft commander made improper evaluation of possible emergency. Instead of making power-on landing, he flared too low during autorotation and aircraft crashed.

UH-1D: IP allowed airspeed to get too low for recovery before realizing the tail rotor had failed. Aircraft spun three full turns, indicating misapplication of power and pitch.

Pilot No. 12

UH-1D: Aircraft commander had flown 8½ hours that day, suffered vertigo, and flew into river at 0002 hours. Fatigue was a factor.

OH-23G: Gusty winds flexed main rotor into tail boom during shutdown.

Pilot No. 13

OH-13S: Aircraft was started with blade tied down. Engine ran for 25 seconds before shutdown.

UH-1D: Engine failed, aircraft was autorotated to dusty road, and exaggerated flare was made. Visibility was obscured by dust. Pilot had flown 158 hours in 30 days.

Pilot No. 14

OH-13S: WO1 was flying an LTC passenger and exhausted fuel. Caused by eagerness to please.

OH-13S: Number 4 cylinder fouled and pilot made hard landing from autorotation. He could not give cause of accident, didn't know if engine was still running, and could not describe his actions. Thirty days had passed since prior accident.

Pilot No. 15

T-42A: IP gave pilot single-engine landing while right brake was locked. Wheel skidded until tire blew and gear collapsed. IP failed to recognize problem as it developed.

OV-1B: Number 1 engine failed after takeoff. Pilot did not jettison external tanks, did not retract flaps at safe speed, spent time on radio rather than single-engine procedure, made two unnecessary turns, and told observer to eject too low and slow. Observer was killed.

Pilot No. 16

UH-1D: Engine failed shortly after takeoff and aircraft crashed into trees. Poor judgment was used for takeoff route. Open areas were available on other takeoff routes. Pilot had 331 total hours.

UH-1D: Pilot was flying low level (buzzing) and flew aircraft into ground. Copilot stated that pilot had flown low level other times and had scared him. It had been 20 days since previous accident.

Pilot No. 17

UH-1D: Improper autorotative technique was used after engine failure, resulting in hard landing.

UH-1D: Pilot used poor planning, judgment, and technique in making downwind approach to landing pad, and overshot pad. RPM was lost and aircraft rolled over in a mine field. The less experienced copilot noted wind condition by blowing flag. Pilot stated he always made his approach from that direction and changing it never entered his mind.

Pilot No. 18

T-41B: Aircraft struck tree during floursack bombing mission. Pilot said sun was on windshield and he was trying to avoid birds. He had 258 flying hours.

O-1G: Orbiting overhead during road recon, pilot was asked if he could roll aircraft and was told

that he was impressing villagers. He climbed higher, did "split S," and failed to pull up in time. Other witnesses stated he was buzzing vehicles prior to the accident. He was described by a fellow aviator as "an accident waiting to happen."

Pilot No. 19

TO-1A: While undergoing IP training, pilot landed short of strip and hit rock with gear.
TO-1A: IP and student used excessive brakes during night landing and nosed aircraft over. IP was shorter than student and his vision was fixed on the back of the student's neck instead of the runway.

Pilot No. 20

UH-1D: Aircraft commander made downwind approach. Aircraft hit ground and rolled over. Caused by poor planning and crew coordination. Aircraft commander orders were revoked for additional training.
UH-1D: Instructor pilot was flying with another instructor pilot who was at the controls. During a practice autorotation, a flare was made and the tail rotor hit the landing area. IP in charge was reluctant to take over controls from another rated IP.

Pilot No. 21

UH-1D: RPM was lost during resupply mission, tail rotor hit tree, and hard landing was made. Aircraft commander did not assist less experienced pilot.
UH-1D: Aircraft commander allowed pilot to hover into another aircraft with turning rotor. Ground guide directions were followed when aircraft was already too close.

Pilot No. 22

UH-1C: Engine failed and aircraft was autorotated into trees. Pilot had 273 flying hours.
UH-1C: Aircraft commander took controls from pilot to demonstrate sideward hovering. Right rear cyclic was applied. Skid hit ground and aircraft rolled over. AC had 581 flying hours.
UH-1D: Aircraft on search and rescue mission was being flown low level, high speed over unfamiliar area and struck wires, killing all aboard. AC had 1,094 flying hours.

Pilot No. 23

OH-6A: Engine failed and main rotor hit tail boom during landing. Pilot was possibly fatigued, having flown 140 hours in 30 days.
OH-6A: IP used improper touchdown technique during practice autorotation and main rotor hit tail boom. IP orders were revoked. This was his first day as an IP.

Pilot No. 24

OH-6A: IP failed to take appropriate corrective action to prevent pilot from making poor autorotative touchdown. Main rotor hit tail boom. IP had 310 flying hours.
OH-6A: Same as above. Suspect apprehension of previous accident (2 days before). IP orders were revoked.

Pilot No. 25

UH-1D: Aircraft lost rpm during resupply mission. Pilot turned downwind to gain rpm and made hard landing. He had flown 92 hours in 14 days.
UH-1D: Pilot used poor pinnacle approach during resupply mission, turned downwind to regain lost rpm, and made hard landing.

Pilot No. 26

UH-1D: Aircraft commander allowed pilot to attempt takeoff after losing rpm. Aircraft hit ground and rolled over.
OH-6A: IP was giving local checkout to pilot. During practice autorotation, pilot pulled too much pitch, causing hard landing and tail boom strike. IP did not evaluate pilot's qualifications.

Pilot No. 27

OH-23G: Pilot, conducting test flight, decided to make touchdown autorotation, pulled pitch too high, and didn't know what to do. Aircraft landed hard. Pilot had made no autorotations since flight school (13 months) and was not familiar with regulations requiring an IP be aboard. He had 533 flying hours.
OH-23G: Pilot experienced partial power loss

on approach to pad, used low level flare, and put tail rotor into water.

Pilot No. 28

TH-55A: Student pilot was conducting slope operations (cleared by IP) in area not suitable for maneuver. Skid caught on sod overhang and rolled aircraft over.

OH-23G: Pilot was told by supervisor to fly mission regardless of wind conditions. He flew into area of turbulence and made autorotation, resulting in hard landing. Wrong procedure for turbulence was used.

Pilot No. 29

UH-1D: Tail rotor failed during hover to revetment after refueling. Collective was lowered, resulting in hard landing. Improper emergency procedures were used.

TH-55A: IP used improper autorotation technique and aircraft landed hard and rolled over. IP was found to be weak in autorotations by standardization pilot.

Pilot No. 30

T-41B: Student pilot stalled at unsafe altitude and did not attempt corrective action, resulting in hard landing. He had two previous hard landings and was considered a below average student.

O-1G: Pilot failed to maintain sufficient terrain clearance. Aircraft struck tree and crashed. Suspect target fixation.

Pilot No. 31

OH-13S: Pilot did not clear tail rotor and experienced tail rotor strike.

OH-13S: Pilot was flying C&C mission in an aircraft with known vibration. Short shaft failed and aircraft spun, crashed, and burned.

Pilot No. 32

UH-1D: Aircraft commander hovered between two parked aircraft. Tail rotor struck tied down rotor of parked aircraft. AC lowered collective and made hard landing. Aircraft commander orders were revoked.

TH-55A: During a 180 degree autorotation, IP allowed aircraft commander to develop high sink rate. Aircraft landed hard and tail boom was cut off.

TH-55A: While performing an autorotation, IP made high flare and pitch pull, resulting in hard landing and tail boom chop.

Pilot No. 33

OH-6A: Directional control was lost during armed recon mission. Aircraft impacted ground and rolled over. Suspect pilot was overaggressive and entered maneuver from which he could not recover. He had two previous incidents.

OH-6A: Pilot was told by another pilot that a vibration was present in the aircraft. He decided to take the aircraft anyway. As a hover was established, the transmission failed. Aircraft struck revetment, causing major damage.

OH-6A: During recon mission, engine overspeed was experienced from contaminated fuel control. Pilot made improper diagnosis, used improper emergency procedures, autorotated unsuccessfully, and rolled over.

Pilot No. 34

O-1E: Aircraft groundlooped during landing with quartering tailwind. Pilot blamed faulty brakes (bracket broken, but operational).

O-1G: Aircraft groundlooped during takeoff with crosswind. Pilot blamed revetment for causing wind gust and said he had never landed on that runway before. Runway was 150 feet wide and 10,000 feet long. Pilot was returned to company for additional training.

Pilot No. 35

UH-1D: Pilot made abrupt low level flare during troop lift. Tail skid hit dike and main rotor cut off tail boom. Suspect inexperience. Pilot was on first tour and had 50 hours.

UH-1D: Pilot asked aircraft commander to assist on approach due to previous accident. RPM was lost at termination and aircraft crashed. Pilot was grounded for psychiatric reasons, i.e., anxiety, extreme nervousness, and problems at home. Physical Evaluation Board was pending.

Pilot No. 36

OH-6A: Engine failed in flight and autorotation

was made into tall grass, resulting in hard landing. Pilot had two previous incidents.
OH-6A: Tail rotor drive coupling failed in flight. Pilot did not use proper emergency procedures and made hard landing. He was giving unauthorized flight instruction to observer. He was told several times to get postaccident physical, but left unit without complying.

Pilot No. 37

O-1G: Aircraft groundlooped during landing. Suspect hypoglycemia. Pilot had a habit of not eating breakfast.
O-1G: Aircraft groundlooped during landing and nosed over. Flight surgeon suspected hypoglycemia and unconscious fear or inability to act as aircraft approaches runway. Pilot was recommended for FEB.

Pilot No. 38

OH-23D: Tail rotor hit runway and main rotor hit tail boom during practice autorotation. Suspect IP was fascinated with maneuver and rolled throttle the wrong way.
TH-55A: IP flared too high during autorotation and made poor landing. Main rotor hit tail boom.

Pilot No. 39

OH-6A: Fuel was exhausted after 1 hour. Autorotation and hard landing were made. Pilot relied on fuel gauge and light, even though they had been written up. He thought ground crew had refueled aircraft.
UH-1D: Pilot was permitted to make hovering turn without clearing and hovered into parked aircraft.

Pilot No. 40

OH-6A: Fuel was exhausted and unsuccessful autorotation was made. Pilot did not check fuel prior to departure. Aircraft had faulty fuel gauge.
OH-6A: Aircraft skids hit truck on highway, causing major damage. There were two female Red Cross passengers aboard. Pilot was grounded pending FEB.

Pilot No. 41

U-1A: Instructor pilot (AC) allowed pilot to hit tree 1,000 meters from approach end of runway. AC did not have breakfast, but had heavy lunch. Suspect drowsiness and apathy.
U-1A: Instructor pilot allowed pilot to land short on 4,350-foot runway, resulting in minor damage.

Pilot No. 42

UH-1H: Pilot made steep approach into dusty area, went IFR, and made hard landing. He was restricted to copilot duty for 30 days.
UH-1H: Pilot misinterpreted reaction of aircraft when power was added, thought he was experiencing loss of antitorque control, and made hovering autorotation from 30 feet. Aircraft landed hard. It was recommended he fly only with an experienced aircraft commander. He had two accidents in 2 days.

Pilot No. 43

UH-1D: Aircraft commander allowed pilot to terminate approach to hover, then proceed at 5-foot hover. Pilot went IFR in dust and made hard landing.
UH-1D: Pilot attempted takeoff and lost rpm. Aircraft commander aborted takeoff and hovered to another area for takeoff. Tail rotor struck tree branch. Improper emergency procedures were used, and aircraft drifted sideways and rolled over.

Pilot No. 44

UH-1D: Pilot touched down hard during combat assault. Aircraft commander was complacent and overconfident in ability of pilot.
UH-1D: AC allowed pilot to make approach into area unsuitable for landing. RPM was lost at termination and aircraft commander attempted recovery. Aircraft hit left side low, and main rotor hit terrain.
UH-1D: Aircraft commander let pilot hover from revetment, and tail skid struck ground. When aircraft commander asked what happened, confusion existed as to who had control. Aircraft pitched up and tail rotor struck ground.

APPENDIX B
POINTS FOR COMMAND PREVENTION

1. Remember that any aviator, under the proper combination of stressful circumstances, may commit errors leading to an aircraft accident. There is no pilot error "type." The safety-minded commander will be alert to changes in the behavior of his aviators as they react to the stresses of flying.

2. Be firm with aviators whose accidents were caused by pure carelessness, inattention, or willful misbehavior. Experience has shown that only positive corrective actions will prevent them from repeating.

3. Closely supervise aviators who have just had pilot-error accidents. This study revealed that more than 20 percent of these have their second accident within 60 days of their first one.

4. Be very selective in appointing aviators who have accumulated fewer than 150-200 hours of pilot time since graduation from flight school as instructor pilots. Exercise extreme care in reinstating IP and AC orders once they have been revoked.

5. Carefully guide those pilots who are eager to excel, to succeed, and to accomplish missions at any cost. These can be desirable qualities, but, without proper guidance, this type of eagerness can adversely affect aviators' judgment. It is also wise to question your own attitude in this regard.

6. Supervise aviators with one or more incidents caused by pilot error as closely as if they had been accidents. The difference between an incident and a STRIKE is often measured in inches or seconds. The mistakes involved are often identical.

7. Carefully evaluate and supervise aviators who have had personal error accidents, but will not admit to themselves or others that the fault was their own. Since they do not blame themselves, they do not learn a lesson and will continue in their erroneous ways.

8. If an aviator's accident is suspected of involving a lack of experience, proficiency or currency, he will very likely repeat it if faced with the same situation without being given additional guidance, training, and practice.

9. Be alert to the opinions of each pilot's ability, as expressed by fellow pilots. When one aviator says of another, "He is an accident waiting to happen," it is usually correct.

10. Examine your own aviation accident prevention program. Twenty-two percent of the accidents in this study involved some form of supervisory error as a contributing factor.

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